

UNITED STATES AIR FORCE
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**Proportion of U.S. Civilian
Population Ineligible for U.S. Air
Force Enlistment Based on Current
and Previous Weight Standards**

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PROPORTION OF U.S. CIVILIAN POPULATION INELIGIBLE FOR U.S. AIR FORCE ENLISTMENT BASED ON CURRENT AND PREVIOUS WEIGHT STANDARDS

INTRODUCTION

To ensure enlistment of the healthiest personnel, the U.S. Air Force (USAF) accession process mandates that each applicant meet stringent physical standards, including an acceptable body weight. As our military services face the pressures associated with a time of war, the need for a physically and mentally fit force is apparent. Furthermore, the substantial costs associated with overweight and obesity underlie the necessity of upholding these standards [1, 2].

Until recently, gender-specific weight standards based on height were in place. However, in June 2006 the USAF implemented a new set of height-weight limits utilizing body mass index (BMI) criteria [3, 4]. The acceptable minimum and maximum BMI for all potential enlistees are 19.0 and 27.5 kg/m², respectively. However, if an otherwise qualified individual exceeds the maximum weight limit, alternative body fat assessments are made to guarantee that eligible and qualified enlistees do not get overlooked [5].

Current estimates indicate a substantial proportion of the U.S. general population is overweight or obese [6, 7]. Combined with the amended accession standards, this observed trend in increased body weight may be substantially reducing the pool of eligible enlistees. The purpose of this study is to compare the proportion of the U.S. civilian population that would be ineligible for USAF enlistment based solely on the previous and current maximum allowable weight standards (Table 1) and to document any racial/ethnic and/or gender differences these modifications may produce. A preliminary comparison of the USAF accession population prior to and following the implementation of these standards will also be made to determine if there have been any substantial changes in the demographics of enlistees.

TABLE 1. Maximum Allowable Weight (lbs) Standards for USAF Accession

Height (inches)	Maximum Allowable Weight (lbs) Standards for USAF Accession		
	Previous Limits ¹ Females	Previous Limits ¹ Males	Current Limit ²
58	132	149	131
59	134	151	135
60	136	153	141
61	138	155	145
62	141	158	150
63	142	160	155
64	146	164	160
65	150	169	165
66	155	174	170
67	159	179	175
68	164	184	180
69	168	189	186
70	173	194	191
71	177	199	197
72	182	205	202
73	188	211	208
74	194	218	214
75	199	224	220
76	205	230	225
77	210	236	231
78	215	242	237
79	221	248	244
80	226	254	250

¹U.S. Air Force Instruction 48-123, *Medical Examinations and Standards*, 22 May 2001

²U.S. Air Force Instruction 48-123, Vol 2-*Accession Retention and Administration*, 5 June 2006

METHODS

Publicly available data collected between 2001 and 2004 for the National Health and Nutrition Examination Survey (NHANES) were utilized in this descriptive study. The NHANES is a public health surveillance program coordinated by the Centers for Disease Control and Prevention, Atlanta, GA, and consists of an annually administered survey to a stratified random sample of children and adults, with targeted oversampling of specific groups [8]. Information is collected on a variety of health topics, and a subsample of these individuals undergoes additional anthropometric and physiologic measurements and laboratory examinations.

Military regulations disqualify individuals with certain health conditions that may hinder job performance [3]. Although it was not possible to evaluate each subject for such conditions, a general screen for medical fitness was performed. Subjects were excluded from analysis if their anthropometric records indicated that extremity, height, weight and/or abdominal circumference measurements could not be made or if medical appliances were worn during weighing. Additionally, subjects were excluded if they wore clothes during weighing or reported being pregnant or possibly pregnant.

To try and create a purely civilian study population, subjects were also excluded if they reported prior military service. Although USAF enlistment is allowed among individuals with prior service, only about 5.4% of military recruits have a history of prior service [9]. Furthermore, only individuals between the ages of 17 and 42 years were included. The USAF currently accepts nonprior service applicants 27 years or younger, but a recent federal law increased the maximum eligible age of military accession to 42 years [10].

For the remaining individuals, their body measurements were converted to Imperial units and, in accordance with USAF practice, height fractions were rounded to the nearest 1/4-inch and weight fractions were rounded to the nearest 1/4-pound [11]. BMI was then calculated. Due to the complex structure of NHANES and targeted oversampling of specific groups, sample weights were used when determining the prevalence of ineligibility for USAF accession. A publicly available web-based binomial proportions test was used to assess whether there were significant differences in ineligibility using the previous and current weight standards [12].

USAF accession data were collected from the Defense Manpower Data Center (Seaside, CA). Gender and self-reported race/ethnicity were used to categorize the number of monthly accessions from January 2005 through January 2007. The percent of Whites, Blacks, and Hispanics were calculated separately for males and females, and Wald-Wolfowitz Run's tests were used to determine if there were significant trends in accessions during that time period. These statistical analyses were performed using Microsoft Excel and Stata 8.2.

RESULTS

Between 2001 and 2004 the NHANES was administered to 2,701 males and 3,070 females, ages 17-42 years. Of these, 131 (4.9%) males were excluded from analysis because of possible extremity or truncal defects, clothing was worn during assessments, missing height or weight values, or indication of past military service. Additionally, 194 (6.3%) women were excluded for these same reasons or because of pregnancy or possible pregnancy. Finally, USAF-specific maximum and minimum height limits were applied, resulting in a final study sample of 2,417 males and 2,203 females.

Based on the previous USAF weight standards, ineligibility among various age groups of U.S. civilian males and females ranged from 16-51% and 29-84%, respectively. When employing the new standards, ineligibility among U.S. civilian males increased, ranging from 17-60%, and decreased among females, ranging from 18-67% (Table 2).

TABLE 2. Ineligibility for USAF Enlistment Based on Weight Standards, by Race and Age

Ineligibility for USAF Enlistment Based on Weight Standards, by Race and Age										
Race	Age Group (yrs)	N	MALES		p-value	FEMALES		p-value		
			Percent Ineligible			Percent Ineligible				
			Old Standards	New Standards		Old Standards	New Standards			
All	17-19	852	21.7	23.4	0.38	704	30.3	20.8	<0.001	
	20-24	392	29.7	33.3	0.28	338	44.7	35.3	0.01	
	25-29	347	33.1	38.8	0.11	282	47.9	38.8	0.03	
	30-34	320	37.6	40.8	0.37	314	51.2	40.3	0.01	
	35-39	287	44.7	47.6	0.50	332	54.2	41.4	<0.001	
	40-42	219	49.3	54.4	0.29	233	56.8	45.8	0.02	
	17-42	2417	36.0	39.7	0.01	2203	48.4	37.9	<0.001	
White	17-19	238	25.5	26.6	0.84	223	28.8	18.1	0.01	
	20-24	157	29.3	33.1	0.47	151	39.7	30.5	0.09	
	25-29	148	32.0	38.0	0.27	124	40.0	31.0	0.11	
	30-34	142	37.4	38.8	0.81	158	46.5	35.7	0.04	
	35-39	128	48.1	49.6	0.90	168	48.2	37.8	0.05	
	40-42	109	50.9	56.4	0.42	95	51.7	42.5	0.19	
	17-42	922	37.5	40.8	0.15	919	43.4	33.4	<0.001	
Black	17-19	287	15.5	16.6	0.73	217	42.5	34.1	0.08	
	20-24	95	30.2	32.2	0.76	83	62.7	50.2	0.12	
	25-29	67	42.2	44.7	0.73	59	72.6	67.2	0.55	
	30-34	73	42.3	50.3	0.32	65	75.2	63.1	0.13	
	35-39	52	43.3	45.0	1.00	74	78.4	57.8	0.01	
	40-42	41	50.5	52.5	0.83	52	84.0	73.7	0.15	
	17-42	615	36.1	39.2	0.26	550	70.2	57.9	<0.001	
Mexican American	17-19	255	18.7	22.1	0.38	214	35.2	29.3	0.22	
	20-24	102	27.8	31.9	0.44	79	47.0	35.3	0.15	
	25-29	100	32.1	38.3	0.37	73	63.8	47.1	0.03	
	30-34	82	46.4	55.1	0.27	65	69.4	52.9	0.05	
	35-39	68	49.6	60.1	0.23	66	55.1	40.4	0.12	
	40-42	55	44.4	53.0	0.34	66	67.2	48.7	0.03	
	17-42	662	36.2	42.9	0.01	563	56.6	42.4	<0.001	

Gender-specific differences between the previous and newly implemented USAF weight standards for accession were observed. Among males, although there were no statistically significant differences in ineligibility among the age and racial/ethnic subcategories, each of these groups underwent increases in the proportion of males who would be ineligible for USAF enlistment. When males ages 17-42 years were combined into one category, there were significant increases in the proportion of ineligibility observed among the group as a whole, as well as Mexican-Americans (Table 2).

Conversely, among females there were decreases in the proportion of ineligible U.S. civilians across all age and racial/ethnic subcategories. When combined into one racial/ethnic category, there were statistically significant decreases in the proportion of ineligible females across all age categories. However, when stratified by race/ethnicity, Black females experienced the least increase in eligibility, and the majority of this group over 19 years of age is still ineligible for enlistment based solely on weight standards. Finally, when combining all age categories into one group, significant changes in eligibility were observed among women of all races.

Based on accession data, there were no significant differences observed in the gender and racial/ethnic groups that enlisted into the USAF between January 2005 and January 2007 (Figure 1). Among both gender and all racial/ethnic groups, however, there is evidence of a nonsignificant, slight increase in USAF enlistment during this time period.

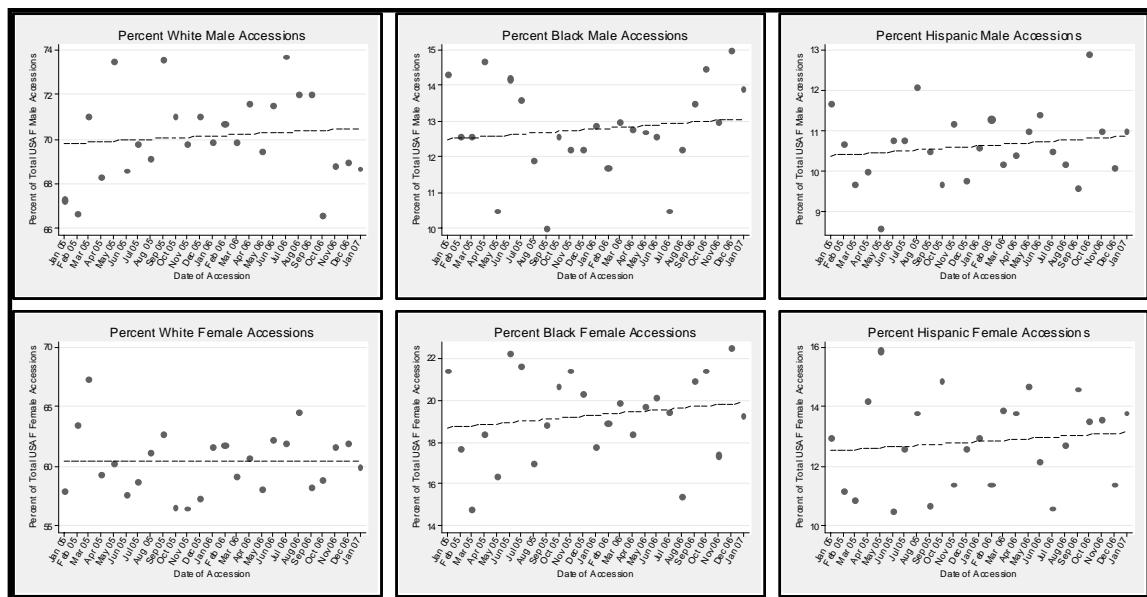


Figure 1. USAF Accessions by Gender and Race/Ethnicity, January 2005 to January 2007

DISCUSSION

In June 2006, the USAF implemented a new set of weight standards for enlistment, representing a switch from gender-specific height and weight requirements to a single standard based on BMI. Although the increased leniency of weight standards has significantly increased the eligible pool of civilian female accessions, there have been no significant changes in the proportion of females who have enlisted between January 2005 and January 2007. Conversely, the modified weight standards resulted in more stringent requirements for males, thereby reducing the pool of eligible enlistees, but no significant changes in the rates of male enlistment during that time were observed.

In an earlier assessment of civilian ineligibility, Nolte, et al. utilized NHANES III data from 1988 to 1994 and the previous USAF standards to report that approximately 13-36% of the population would not meet the accession weight limits. Utilizing NHANES data from 2001 to

2004, Yamane (unpublished data) noted much higher proportions of ineligibility across all military branches, with a range of 17-67% in the USAF. The substantial increased ineligibility observed between these studies reaffirms the growing obesity epidemic in the U.S. civilian population.

Improvements in the proportion of ineligible civilians were evident in all female categories. However, among black females, significant improvement was only seen in the 35-39 age category. Moreover, the most worrisome study finding is that the majority of black civilian females over age 19 are still ineligible for enlistment, even with the more lenient weight standards. This group, nonetheless, is still more highly represented in the USAF enlistees than compared to the general U.S. population [9].

The novelty of this study is noteworthy in that it provides the first assessment of the potential impact the new weight standards could have on USAF enlistment using the U.S. civilian population as a reference. Additionally, height and weight assessments were performed in a standardized manner by trained personnel thereby removing any biases that may have been introduced by self-report or variations in individual measurements.

It is imperative, however, that these results also be interpreted in light of this study's limitations. First, this evaluation of the new accession weight standards likely represents an overestimation of the proportion of civilians who are truly ineligible for USAF enlistment based solely on weight. The weight standards serve as a preliminary appraisal, and should an individual exceed these limits, he/she may undergo a standardized body fat measurement, which has age and gender-specific limits. Additionally, an otherwise-qualified applicant may be given a prescribed amount of time in which to improve his/her weight so as to meet these accession standards [13]. However, based on the nature of the NHANES data and body assessments, it was not possible to determine what proportion of the U.S. civilian population may fall into these categories. Finally, it is also important to recognize that Mexican-American and Hispanic racial and ethnic categories were compared because of differences of reporting in each data source. Although these groups share some overlap, they are not identical; the USAF Hispanic category is more encompassing and contains individuals from a variety of races. However, based on the limits of these data, more refined assessments could not be made, but it is unlikely that any observed relationships would be significantly impacted.

Physical fitness is considered an integral component of the military and an essential component of carrying out the USAF mission [1, 14]. Combined with the long-term costs, lost productivity, and adverse health events associated with overweight and obesity, the need for physically fit personnel is apparent [2, 15-17]. Although significant changes in the demographics of USAF enlistees have not been observed since the recent implementation of the new weight standards, it may be in the longterm that we see the benefits of these new limits and the new challenges posed by the increased prevalence of obesity in the U.S. civilian population.

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